

REMARKS

The Applicant respectfully submits the following responses as a good faith attempt to address each of the issues raised by the Examiner. The Examiner has rejected the claims under 35 USC 103.

Rejection of Claims Under 35 USC 103

The Examiner has rejected claims 1 to 26 as being unpatentable over Chen, U.S. Patent No. 5,970,376 (hereinafter "Chen '376") in view of Pangrle et al, U.S. Patent No. 6,566,283 (hereinafter "Pangrle '283") and Wu et al., U.S. Patent No. 6,720,256 (hereinafter "Wu '256") and Hsue et al, U.S. Patent No. 6,696,222 (hereinafter "Hsue '222"). The applicant respectfully disagrees with this rejection and provides arguments to overcome this rejection below.

Firstly, the Examiner appears to have identified the basis for the obviousness rejection for claims: 2, 7, 18, 4, 8, 6, 10, 11, and 12. However, the Examiner has not described with particularity the relevant teaching that apply to the obviousness rejection for claims 1, 3, 5, 9, 13-17, and 19-26. Notably, the Applicant has submitted four independent claims: 1, 6, 14 and 20, and the Examiner only described the relevant teaching for a single independent claim, i.e. claim 6. The Examiner shall appreciate that the difference in the claims over the applied references have not been particularly described in accordance with MPEP 706.02(j)(B). Additionally, the proposed modifications of the applied reference necessary to arrive at the claimed subject matter has also not been described particularly for each claim in accordance with MPEP 706.02(j)(C).

Secondly, it appears that the Examiner places substantial reliance on Chen '376. The Examiner appears to use Chen '376 to teach the use of nitrous oxide (N₂O) for stripping of the photoresist from an IC structure having a photoresist and an OSG. However, the Examiner does not particularly describe the location of the nitrous oxide within the Chen '376 disclosure. The Applicant undertook a query of the specification and found a *single* mention of "nitrous oxide" in col. 11: line 3 of Chen '376. The term "nitrous oxide" is used in the following paragraph:

Within the first preferred embodiment of the present invention, the oxygen containing stripping plasma 44 may employ an oxygen containing stripping gas chosen from the group of oxygen containing stripping gases consisting of oxygen, ozone, *nitrous oxide* and nitric oxide. More preferably, the oxygen containing stripping plasma 44 comprises oxygen. Most preferably, the oxygen containing stripping plasma 44 consists of oxygen. Preferably, the oxygen containing stripping plasma 44 also employs: (1) a reactor chamber pressure of from about 10 to about 20 torr; (2) a radio frequency power of from about 400 to about 750 watts at a radio frequency of 13.56 MHZ; (3) a substrate 30 temperature of from about 200 to about 300 degrees centigrade; and (4) an oxygen flow rate of from about 5000 to about 8000 standard cubic centimeters per minute (sccm).

No other reference to nitrous oxide is made in Chen '376. Additionally, there is no reference in Chen '376 to an organosilicate glass (OSG) material. Therefore, it appears that the Examiner relied in this single mention of the term "nitrous oxide" to form the basis on his obviousness rejection.

Assuming the Examiner's reliance on Chen '376 as described above, the Applicant contends that the Examiner has not been able to establish a *prima facie* case of obviousness in accordance with 35 U.S.C. 103 for each independent claim. Specifically, there must be some "suggestion or motivation, either in the reference themselves or in the knowledge generally available to one of ordinary skill in the art, to combine reference teachings with a reasonable expectation of success."

Here the combination of the references do not teach every element of claim 1, 6, 14 and 20. When the combination of the references do teach every element of the claims, yet lacks the requisite motivation to combine, a rejection based on a *prima facie* case of obviousness is improper. In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998).

Further, In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988), stands for the proposition that there is no motivation to merely substitute a particular compound into a system of the primary reference to make a *prima facie* obviousness rejection. There, the claims were directed to a system for detecting and measuring minute quantities on nitrogen compounds comprising a gas chromatograph, a converter which converts nitrogen compounds into nitric oxide by combustion, and a nitric oxide detector. The court found that there was no support or explanation to merely substitute one type of detector for another in the system of the primary reference. Likewise, here, no such motivation or support exists to merely substitute Pangrle '283 low k dielectric layer OSG film into the Chen '376 process.

Finally, although In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986), held that a reasonable expectation of success will allow for a proper *prima facie* case of obviousness. No such facts are present in this case. There, a research paper comparing the pharmacological properties of two compounds suggested clinical testing for successful commercialization. Here, no such paper has been cited or written or corresponding process validation conducted. To the contrary, the Pangrle '283 low dielectric layer has never been developed successfully within a process such as Chen '376 nor has its introduction within such a process been predicted in relevant technical

literature. Therefore, In re Merck & Co. is distinguishable from the facts of the enclosed patent application.

With respect to claim 1, Hsue '222 does not appear to be applicable. According to the Examiner, Hsue '222 teaches a method of forming a dual damascene process using metal hardmask layer comprising the step of etching the trench into the second hardmask layer (see figure 2b-2c) and applying another photoresist layer (44) to form a via etch (45) by etching into the OSG layer (36, see figure 2d-2f). However, claim 1 is not directed to dual damascene process. Subsequently, dependent claims 2 and 5 are also not directed to the dual damascene process and hence not applicable to any discussion concerning Hsue '222. On the other hand, claims 3 and 4 are directed to a dual damascene process where the stripping method of claim 1 is used. However, in light of Merck and MPEP 2143, no reasonable expectation of success has been offered in support of Examiners *prima facie* obviousness argument.

In addition, Graham v. John Deere, 383 U.S. 1, 148 USPQ 459 (1966) held that secondary considerations may be utilized to support an *indicia of unobviousness* including commercial success, unexpected results, long felt but unsolved needs, and failure of others. Here, the claimed subject matter yields such unexpected results. In light of the lack of technical literature predicting the testing of low dielectric k layer OSG in Pangrle '283 and Chen '376, there is no suggestion of the feasibility of such a combination.

Thus, the Examiner has not satisfied the requirements for a 35 U.S.C. 103 obviousness rejection of claim 1. Further, dependent claims 2-5 also do not meet the requirements for a *prima facie* case of obviousness.

There is no motivation or suggestion for using nitrous oxide (N₂O) gas to strip the photoresist of an IC structure having an OSG layer nor evidence of a reasonable expectation of success in any of the cited references. Further still, the Applicant describes the substantial superiority of using nitrous oxide for photoresist removal of IC structure having an exposed OSG layer.

Page 4 of Applicant's patent application, as previously argued, identifies particular problems associated with removing a photoresist layer using commercial gases and mixtures. Table 2 of the Applicant's patent application compares various gases to nitrous oxide and shows the substantial superiority of nitrous oxide. Prior art neither identifies these problems nor suggests the claimed subject matter. Thus, in accordance with Graham v. John Deere, Applicant demonstrates unexpected results in solving such a problem when compared to prior art. Furthermore, the cited references must be viewed without the benefit of impermissible hindsight vision afforded by Applicant's claims. See Hodosh v. Block Drug Co., Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

Consequently, Applicant respectfully requests that claims 1-5 be allowed in accordance with the amended claims filed on December 9, 2004.

Next, the Examiner appears to argue that claims 6-13 would have been obvious to one skilled in the art to combine the Chen '376 process in light of the Wu '256 process to form the claimed subject matter. According to the Examiner, Wu '256 teaches forming a dual damascene (see figure 6d), forming the hard mask layer selected from the group consisting of silicon nitride (see col.9, lines 62-67), providing a via etched into the IC structure (see figure 6a), generating an organic plug (80, called resin) that occupies the via, and stripping organic plug (see figure 6d-6e). The Examiner then concludes that it

would be obvious to merely substitute the Wu '256 dual damascene in the Chen '376 process because it would provide a "wider process latitude and higher yield during the formation of dual damascene structures."

However, no such process validation has ever been conducted to indicate that such a combination would be successful or result in a reasonable expectation of success in accordance with MPEP 2143. Further, no corresponding technical literature has been cited to indicate the commercial viability of such a combination as in In re Merck & Co. The result, as above, leads to the conclusion that the claimed subject matter is distinguished from Merck and does not support an obviousness rejection under 35 U.S.C. 103.

Although a wider process latitude and higher yield are common objectives in the art, there is no indication that such results could be reasonably expected from any or all of the cited references. Further, the cited references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed subject matter. See MPEP 2141 and Hodosh. Here, no such indication has been offered by the cited references to suggest such a result as achieved from the claimed subject matter. Thus, the claimed subject matter of Applicant yields unexpected results. Such unexpected results are evidence of secondary considerations and indicia of unobviousness. See Graham v. John Deere.

Thus, the Examiner has not satisfied the requirements for a 35 U.S.C. 103 obviousness rejection of claim 6 of the claimed subject matter. Further, dependent claims 7-13 also do not meet the requirements for a *prima facie* case of obviousness.

Consequently, Applicant respectfully requests that claims 6-13 be allowed in accordance with the amended claims filed on December 9, 2004.

Independent claim 14 is directed to a method of performing a via first etch with an IC structure that includes a photoresist layer and an OSG layer. The examiner has not particularly and directly addressed claim 14 in accordance with MPEP 706.02(j). However, based on the broad, general discussion from Examiner arguments to combine Wu '256, Hsue '222, Pangrle '283 and Chen '376, a similar argument can be developed that shows the elements of a *prima facie* obviousness case are again absent.

Although Pangrle '283 discloses a low dielectric k layer silsesquioxane SOG such as an OSG film, no results from the reference would lead to utilizing the compound in conjunction with nitrous oxide to achieve a via first etch with an IC structure including a photoresist layer. Thus, such a combination must be considered as an unexpected result and *indicia of unobviousness* in accordance with the secondary factors set forth in Graham v. John Deere. Further, as discussed *supra*, references must be viewed without the benefit of impermissible hindsight vision afforded by the Applicant's claimed subject matter. MPEP 2141.

Thus, the Examiner has not satisfied the requirements for a 35 U.S.C. 103 obviousness rejection of claim 14 of the claimed subject matter. Further, dependent claims 15-19 also do not meet the requirements for a *prima facie* case of obviousness.

Consequently, Applicant respectfully requests that claims 14-19 be allowed in accordance with the amended claims filed on December 9, 2004.

Independent claim 20 is directed to a method of performing a trench first etch of an IC structure that includes a photoresist layer and an OSG layer. The examiner has also not particularly and directly addressed claim 20 in accordance with MPEP 706.02(j). However, as discussed *supra*, based on the broad, general discussion from Examiner arguments to combine Wu '256, Hsue '222, Pangrle '283 and Chen '376, a similar

argument can be developed that shows the elements of a *prima facie* obviousness case are once more absent.

The Examiner argues that it would have been obvious to a person of ordinary skill in the requisite art at the time to etch the trench into the second hard mask layer and apply another nitrous oxide gas stripping to the photoresist layer to form the desired trench etch that would result in a superior method of performing the trench first etch. However, no such combination would result in the reasonable expectation of success. Thus, such a combination must be considered as an unexpected result and indicia of unobviousness in accordance with the secondary factors set forth in Graham v. John Deere. Further, as discussed *supra*, references must be viewed without the benefit of impermissible hindsight vision afforded by the Applicant's claimed subject matter. MPEP 2141.

Thus, the Examiner has not satisfied the requirements for a 35 U.S.C. 103 obviousness rejection of claim 20 of the enclosed claimed subject matter. Further, dependent claims 21-26 also do not meet the requirements for a *prima facie* case of obviousness.

Consequently, Applicant respectfully requests that claims 20-26 be allowed in accordance with the amended claims filed on December 9, 2004.

Finally, Applicant respectfully reserves the right to more fully argue the merits of all dependent claims at a later date in response to a particular and specific argument on an individual claim basis. Further, in light of no specific arguments directed to independent claims 1, 14 and 20, Applicant also respectfully reserves the right to more fully argue the merits of these claims in response to specific objections raised by the Examiner.

In summary, for the aforementioned reasons outlined supra, Applicant respectfully requests allowance of claims 1-26 pending in the present application.

Conclusion

Allowance of claims 1-26 pending in the present application are respectfully requested.

Respectfully Submitted;

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